

Claims

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An apparatus for separating soft food product from firm food product, the apparatus comprising:
  - a rotatable cage having a chamber and a main axis of rotation, wherein the chamber rotates about the main axis of rotation;
  - a first roller having a second axis of rotation and radially disposed on the perimeter of the chamber, wherein the first roller orbits about the main axis of rotation with the chamber, and further wherein the first roller rotates about the second axis of rotation in a first direction; and
  - a second roller having a third axis of rotation and radially disposed on the perimeter of the cage adjacent to the first roller, wherein the second roller orbits about the main axis of rotation with the chamber, and further wherein the second roller rotates about the third axis of rotation in a second direction opposite to the first direction, wherein soft food product is removed from the rotating chamber by the first and second counter-rotating rollers.

2. The apparatus of claim 1 wherein the chamber has a product inlet opening at a first end of the chamber for receiving food product to be sorted.

3. The apparatus of claim 2 wherein the chamber has a product outlet opening at a second end of

3 the chamber opposite the first end for delivering firm  
4 food product out of the chamber.

1 4. The apparatus of claim 3 wherein the main  
2 axis of rotation slopes downward from the inlet opening  
3 to the outlet opening.

1 5. The apparatus of claim 3 further including  
2 a drive unit disposed to drive the rotatable cage.

1 6. The apparatus of claim 1 wherein the  
2 chamber has a product outlet opening for delivering firm  
3 food product out of the chamber.

1 7. The apparatus of claim 1 wherein the first  
2 and second rollers are each covered with a gripping  
3 material.

1 8. The apparatus of claim 1 wherein the first  
2 and second rollers are each brush rollers.

1 9. The apparatus of claim 1 wherein the first  
2 roller is covered with a gripping material and the second  
3 roller is a brush roller.

1 10. The apparatus of claim 1 wherein the first  
2 roller is a brush roller and the second roller is smooth.

1 11. An apparatus for sorting a food  
2 product, such as a fruit or vegetable, comprising:  
3 a chamber;

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4 a plurality of rollers radially spaced  
5 apart around the circumference of the chamber  
6 wherein each of the rollers includes a pinion gear;

7 a first ring gear wherein the first ring  
8 gear engages with every other one of the plurality  
9 of pinion gears to rotate every other one of the  
10 plurality of rollers in a first direction; and

11 a second ring gear wherein the second ring  
12 gear engages with the other ones of the plurality of  
13 pinion gears to rotate the other ones of the  
14 plurality of rollers in a second direction opposite  
15 to the first direction.

1 12. The apparatus of claim 11 wherein the first  
2 ring gear is an external ring gear.

1 13. The apparatus of claim 12 wherein the  
2 second ring gear is an internal ring gear.

1 14. The apparatus of claim 11 wherein the  
2 chamber includes a receiving end disposed to receive the  
3 food product to be sorted into the chamber.

1 15. The apparatus of claim 12 wherein the  
2 chamber further includes a discharge end disposed to  
3 deliver sorted food product out of the chamber.

1 16. An apparatus for sorting a food  
2 product, such as a fruit or vegetable, the apparatus  
3 comprising:

4 a first plurality of rollers radially  
5 disposed about a first axis of rotation, each of the  
6 first plurality of rollers having a pinion gear  
7 attached thereto;

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8                   a second plurality of rollers radially  
9                   disposed about the first axis of rotation, each of  
10                  the second plurality of rollers having a pinion gear  
11                  attached thereto, wherein the first and second  
12                  plurality of rollers define a chamber for receiving  
13                  the food product to be sorted;

14                  a first ring gear, wherein the first ring  
15                  gear engages with each of the pinion gears attached  
16                  to the first plurality of rollers to impart rotation  
17                  to the first plurality of rollers in a first  
18                  direction; and

19                  a second ring gear, wherein the second ring  
20                  gear engages with each of the pinion gears attached  
21                  to the second plurality of rollers to impart  
22                  rotation to the second plurality of rollers in a  
23                  second direction opposite to the first direction.

1                   17. The apparatus of claim 16 wherein the first  
2                   ring gear is an external ring gear.

1                   18. The apparatus of claim 17 wherein the  
2                   second ring gear is an internal ring gear.

1                   19. The apparatus of claim 16 wherein the  
2                   chamber has a product inlet opening at a first end for  
3                   receiving food product to be sorted.

1                   20. The apparatus of claim 19 wherein the  
2                   chamber has a product outlet opening at a second end  
3                   opposite the first end for delivering sorted food product  
4                   out of the chamber.

1                   21. An apparatus for sorting a food  
2                   product such as a fruit or vegetable, wherein the

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3 apparatus sorts soft food product from firm food  
4 product, the apparatus comprising:

5 a cage having a chamber, wherein the  
6 chamber is rotatable about a main axis; and

7 a plurality of rollers radially spaced  
8 apart around the circumference of the chamber  
9 wherein adjacent rollers from the plurality of  
10 rollers rotate in opposite directions as the chamber  
11 rotates around the main axis to expel soft food  
12 product radially out of the chamber.

1 22. The apparatus of claim 21 wherein the  
2 chamber has a product inlet opening at a first end of the  
3 chamber for receiving food product to be sorted.

1 23. The apparatus of claim 22 wherein the  
2 chamber has a product outlet opening at a second end of  
3 the chamber opposite the first end for delivering firm  
4 food product out of the chamber.

1 24. The apparatus of claim 23 wherein the main  
2 axis slopes downward from the inlet opening to the outlet  
3 opening.

1 25. The apparatus of claim 23 further including  
2 a drive unit disposed to drive the rotatable chamber.

1 26. The apparatus of claim 21 wherein each of  
2 the plurality of rollers is covered with a gripping  
3 material.

1 27. The apparatus of claim 21 wherein each of  
2 the plurality of rollers is a brush roller.

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1           28. The apparatus of claim 21 wherein adjacent  
2 pairs of rollers from the plurality of rollers include  
3 both a brush roller and a smooth roller.

1           29. The apparatus of claim 21 wherein adjacent  
2 pairs of rollers from the plurality of rollers include  
3 both a brush roller and a gripping roller.

1           30. An apparatus for sorting a food  
2 product such as a fruit or vegetable, wherein the  
3 apparatus sorts soft food product from firm food  
4 product, the apparatus comprising a plurality of  
5 rotatable rollers arranged in radially spaced-apart  
6 relationship about a main axis of rotation so as to  
7 define a chamber for receiving the food product to  
8 be sorted, wherein each of the plurality of rollers  
9 orbits about the main axis of rotation, and further  
10 wherein each of the plurality of rollers has its own  
11 axis of rotation, wherein adjacent rollers from the  
12 plurality of rollers rotate about their own axis of  
13 rotation in opposite directions to remove soft food  
14 product from the chamber.

1           31. An apparatus for sorting a food  
2 product, such as a fruit or vegetable, wherein the  
3 apparatus sorts soft food product from firm food  
4 product, the apparatus comprising a product sorting  
5 chamber rotatable about a main axis wherein the  
6 chamber is configured to expel substantially all of  
7 the soft food product radially outward from the  
8 chamber as the chamber rotates.

1           32. The apparatus of claim 31 wherein the  
2 chamber further includes a discharge end, wherein the

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3 chamber is configured to discharge substantially all of  
4 the firm food product out of the chamber through the  
5 discharge end as the chamber rotates.

1 33. The apparatus of claim 31 further  
2 comprising an inlet opening at a first end of the chamber  
3 for receiving food product to be sorted into the chamber.

1 34. The apparatus of claim 33 further  
2 comprising an outlet opening at a second end of the  
3 chamber opposite the first end for delivering firm food  
4 product out of the chamber.

1 35. An apparatus for sorting a food  
2 product, such as a fruit or vegetable, wherein the  
3 apparatus sorts soft food product from firm food  
4 product, the apparatus comprising a generally  
5 cylindrical product sorting chamber rotatable about  
6 a main axis wherein the chamber is configured to  
7 expel at least 50 percent of the soft food product  
8 radially outward from the chamber as the chamber  
9 rotates.

1 36. The apparatus of claim 35 wherein the  
2 chamber further includes a discharge end, wherein the  
3 chamber is configured to discharge firm product out of  
4 the chamber through the discharge end as the chamber  
5 rotates.

1 37. A method of sorting a food product,  
2 such as a fruit or vegetable, wherein soft food  
3 product is separated from firm food product, the  
4 method comprising:

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5                   introducing the food product to be sorted  
6                   into a rotating chamber; and  
7                   expelling soft food product out of the  
8                   rotating chamber between first and second counter-  
9                   rotating rollers radially disposed about the  
10                  rotating chamber.

1                  38. The method of claim 37 further comprising  
2                  delivering firm food product out of an end of the  
3                  rotating chamber.

1                  39. The method of claim 37 wherein the chamber  
2                  rotates at a speed in the range of 25 to 30 revolutions  
3                  per minute.

1                  40. The method of claim 37 wherein the chamber  
2                  rotates at a speed less than 35 revolutions per minute.

1                  41. A method of sorting a food product,  
2                  such as a fruit or vegetable, wherein soft food  
3                  product is separated from firm food product, the  
4                  method comprising:

5                   rotating a chamber having a receiving end  
6                   and a discharge end;

7                   introducing the food product to be sorted  
8                   into the chamber at the receiving end;

9                   allowing the firm food product to pass out  
10                  of the chamber at the discharge end; and

11                  allowing the soft food product to pass out  
12                  of the chamber through counter-rotating rollers  
13                  radially disposed around the circumference of the  
14                  chamber.

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1           42. The method of claim 41 wherein the chamber  
2 rotates at a speed in the range of 25 to 30 revolutions  
3 per minute.

1           43. The method of claim 41 wherein the chamber  
2 rotates at a speed less than 35 revolutions per minute.

1           44. A method of separating soft food  
2 product from firm food product comprising:  
3           passing soft food product through a pair of  
4 counter-rotating rollers as the pair of counter-  
5 rotating rollers orbit in a 360 degree path about a  
6 central axis of rotation.

1           45. A method of separating soft food  
2 product from firm food product comprising:  
3           rotating a chamber about a main axis;  
4           introducing the food product to be sorted  
5 into the chamber;  
6           expelling substantially all of the soft  
7 food product radially out of the chamber.

1           46. The method of claim 45 further comprising  
2 introducing the food product to be sorted into a  
3 receiving end of the chamber.

1           47. The method of claim 46 further comprising  
2 discharging the firm food product out of a discharge end  
3 of the chamber.

1           48. The method of claim 45 further comprising  
2 discharging substantially all of the firm food product  
3 out of a discharge end of the chamber.

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1           49. The method of claim 45 wherein the soft  
2 food product is radially expelled from only the lower  
3 one-half of the chamber as the chamber rotates.

1           50. The method of claim 45 wherein the soft  
2 food product is radially expelled from only the lower  
3 two-thirds of the chamber as the chamber rotates.

1           51. The method of claim 45 wherein the soft  
2 food product is radially expelled from the chamber as the  
3 chamber rotates at less than 35 revolutions per minute.

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